

Serial No. 09/542222

- 2 -

Art Unit: 2128

In the claims:

1. (previously presented) A channel shortening method comprising:

determining a first shortened channel impulse response for a communication channel using a first channel modeling scheme;

forming a time-mirrored image of the first shortened channel impulse response;

determining a second shortened channel impulse response for the time-mirrored image of the first shortened channel impulse response using a second channel modeling scheme;

combining the first shortened channel impulse response with an inverse of the second shortened channel impulse response to obtain a third shortened channel impulse response; and

employing the third shortened channel impulse response to configure a time domain equalizer.

2. (original) The channel shortening method of claim 1, wherein determining a first shortened channel impulse response for a communication channel using a first channel modeling scheme comprises applying an auto-regressive moving average model using  $p_1$  poles and  $q_1$  zeros to form the first shortened channel impulse response having a first approximation  $H_1(z) = B_1(z)/1+A_1(z)$ , wherein  $q_1$  is greater than a predetermined cyclic prefix length.

3. (original) The channel shortening method of claim 1, wherein determining a second shortened channel impulse response for the time-mirrored image of the first shortened channel impulse response using a second channel modeling scheme comprises applying an auto-regressive moving average model using  $p_2$  poles and  $q_2$  zeros to form the second shortened channel impulse response

Serial No. 09/542222

- 3 -

Art Unit: 2128

having a second approximation  $H_1(z) = B_1(z)/1+A_1(z)$ , wherein  $q_1$  is less than or equal to a predetermined cyclic prefix length.

4. (original) The channel shortening method of claim 1, wherein the first shortened channel impulse response has a first approximation  $H_1(z) = B_1(z)/1+A_1(z)$  and the second shortened channel impulse response has a second approximation  $H_2(z) = B_2(z)/1+A_2(z)$ , and wherein combining the first shortened channel impulse response with an inverse of the second shortened channel impulse response to obtain a third shortened channel impulse response comprises combining  $A_1(z)$  and  $A_2(1/z)$  with appropriate delay.
5. (original) The channel shortening method of claim 1, wherein the first channel modeling scheme is based upon a pole-zero model having  $p_1$  poles and the second channel modeling scheme is based upon a pole-zero model having  $p_2$  poles and wherein the number of taps in a channel shortening filter equals  $(p_1+p_2 +1)$ .
- 6.(original) The method of claim 1, wherein the communication channel is an Asymmetric Digital Subscriber Line (ADSL) upstream channel.
7. (original) An apparatus comprising a time-domain equalizer for equalizing a communication channel and training logic for training the time-domain equalizer based upon a training signal received over the communication channel, wherein the training logic is operably coupled to determine a set of coefficients for the time-domain equalizer using a two-pass auto-regressive moving average model.

Serial No. 09/542222

- 4 -

Art Unit: 2128

8. (original) The apparatus of claim 7, wherein the training logic comprises:

first channel modeling logic operably coupled to determine a first shortened channel impulse response for the communication channel;

inversion logic operably coupled to form a time-mirrored image of the first shortened channel impulse response;

second channel modeling logic operably coupled to determine a second shortened channel impulse response for the time-mirrored image of the first shortened channel impulse response; and

coefficient determination logic operably coupled to combine the first shortened channel impulse response with an inverse of the second shortened channel impulse response to obtain a third shortened channel impulse response.

9.(original) The apparatus of claim 8, wherein the first channel modeling logic is operably coupled to apply an auto-regressive moving average model using  $p_1$  poles and  $q_1$  zeros to form the first shortened channel impulse response having a first approximation  $H_1(z) = B_1(z)/1+A_1(z)$ , wherein  $q_1$  is greater than a predetermined cyclic prefix length.

10. (original) The apparatus of claim 8, wherein the second channel modeling logic is operably coupled to apply an auto-regressive moving average model using  $p_2$  poles and  $q_2$  zeros to form the second shortened channel impulse response having a second approximation  $H_2(z) = B_2(z)/1+A_2(z)$ , wherein  $q_2$  is less than or equal to a predetermined cyclic prefix length.

Serial No. 09/542222

- 5 -

Art Unit: 2128

11. (original) The apparatus of claim 8, wherein the first shortened channel impulse response has a first approximation  $H_1(z) = B_1(z)/1+A_1(z)$  and the second shortened channel impulse response has a second approximation  $H_2(z) = B_2(z)/1+A_2(z)$ , and wherein the coefficient determination logic is operably coupled to combine  $A_1(z)$  and  $A_2(1/z)$  with appropriate delay in order to obtain the third shortened channel impulse response.

12. (original) The apparatus of claim 8, wherein the first channel modeling logic is based upon a pole-zero model having  $p_1$  poles and the second channel modeling logic is based upon a pole-zero model having  $p_2$  poles, and wherein the number of taps the time-domain equalizer equals  $(p_1 + p_2 + 1)$ .

13. (original) The apparatus of claim 7, wherein the communication channel is an Asymmetric Digital Subscriber Line (ADSL) upstream channel, and wherein the apparatus is a central ADSL terminal unit.

14. (previously presented) A program product including a computer readable medium having stored therein a computer program, the computer program for training a time-domain equalizer based upon a training signal received over a communication channel, the program product comprising:

first channel modeling logic programmed to determine a first shortened channel impulse response for the communication channel;

inversion logic programmed to form a time-mirrored image of the first shortened channel impulse response;

Serial No. 09/542222

- 6 -

Art Unit: 2128

second channel modeling logic programmed to determine a second shortened channel impulse response for the time-mirrored image of the first shortened channel impulse response;

coefficient determination logic programmed to combine the first shortened channel impulse response with an inverse of the second shortened channel impulse response to obtain a third shortened channel impulse response; and

configuration logic operable to employ the third shortened channel impulse response to configure a time domain equalizer.

15. (original) The program product of claim 15, wherein the first channel modeling logic is programmed to apply an auto-regressive moving average model using  $p_1$  poles and  $q_1$  zeros to form the first shortened channel impulse response having a first approximation  $H_1(z) = B_1(z)/1+A_1(z)$ , wherein  $q_1$  is greater than a predetermined cyclic prefix length.

16. (original) The program product of claim 14, wherein the second channel modeling logic is programmed to apply an auto-regressive moving average model using  $p_2$  poles and  $q_2$  zeros to form the second shortened channel impulse response having a second approximation  $H_2(z) = B_2(z)/1+A_2(z)$ , wherein  $q_2$  is less than or equal to a predetermined cyclic prefix length.

17.(original) The program product of claim 14, wherein the first shortened channel impulse response has a first approximation  $H_1(z) = B_1(z)/1+A_1(z)$  and the second shortened channel impulse response has a second approximation  $H_2(z) = B_2(z)/1+A_2(z)$ , and wherein the coefficient determination logic is programmed to combine  $A_1(z)$  and  $A_2(1/z)$  with appropriate delay in order to obtain the third shortened channel impulse response.

Serial No. 09/542222

- 7 -

Art Unit: 2128

18. (original) The program product of claim 14, wherein the first channel modeling logic is based upon a pole-zero model having  $p_1$  poles and the second channel modeling logic is based upon a pole-zero model having  $p_2$  poles, and wherein the number of taps the time-domain equalizer equals  $(p_1 + p_2 + 1)$ .

19. (original) The program product of claim 14, wherein the communication channel is an Asymmetric Digital Subscriber Line (ADSL) upstream channel.

20. (cancelled)